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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/828,475

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Yoshihisa Dotta

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EXAMINER

NADAV, ORI

ART UNIT

PAPER NUMBER

2811

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/828,475	<b>Applicant(s)</b> DOTTA ET AL.	
	<b>Examiner</b> Ori Nadav	<b>Art Unit</b> 2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 30 January 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-9 and 17-27 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-9 and 17-27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 1-2, 4-9 and 17-26 are rejected under 35 U.S.C. 102(a) as being anticipated by Applicant Admitted Prior Art (AAPA).

AAPA teaches in figures 16-17 and related text a semiconductor apparatus, comprising:

a semiconductor substrate 101;

a field oxide film 102 formed over a surface of the semiconductor substrate, the field oxide film having an aperture section;

a pad electrode 104, having an aperture section formed there-through, the pad electrode being formed over the field oxide film so as to overlap the field oxide film when perpendicularly viewing the semiconductor substrate, wherein the field oxide film is located directly under substantially all of the pad electrode as viewed cross sectionally, and

a penetration electrode 115 electrically connected to the pad electrode 104, the penetrating electrode being provided so as to pass through each of (a) the aperture section of the field oxide film, (b) a hole formed in the semiconductor substrate, and (c) the aperture section of the pad electrode,

the hole in the semiconductor substrate being formed in the aperture section of the field oxide film, when perpendicularly viewing the semiconductor substrate, so that an opening of the hole is smaller than the aperture section of the field oxide film,

wherein the penetration electrode is formed in a field area of the surface of the semiconductor substrate,

wherein the aperture section of the field oxide film is formed in the aperture section of the pad electrode, when perpendicularly viewing the semiconductor substrate,

wherein the penetration electrode includes a hole-filling section formed in the hole,

wherein the hole-filling section is made of an electrically conductive material,

wherein a pad electrode formed so that there is no overlap with the hole when perpendicularly viewing the semiconductor substrate.

Regarding claims 5-6, AAPA teaches in figures 16-17 and related text an insulating film 109 is formed on an internal surface of the hole, between the internal surface of the hole and a sidewall of the penetration electrode,

Regarding claims 6, 8 and 22-23, AAPA teaches in figures 16-17 and related text a penetration electrode includes an electrically conductive film on the insulating film that is formed on the internal surface of the hole,

wherein the hole-filling section is made of an insulating material and of an electrically conductive material,

wherein the insulating film is in direct contact with the field oxide film,

wherein the pad electrode is formed directly on and contacting the field oxide film.

Regarding claim 21, AAPA teaches in figures 16-17 and related text the aperture section in the pad electrode is larger than the aperture section in the field oxide film, when perpendicularly viewing the semiconductor substrate, because the aperture section in the pad electrode can be arbitrarily chosen to be larger than the aperture section in the field oxide film.

Regarding claims 24-26, AAPA teaches in figures 16-17 and related text a penetration electrode extends through the aperture section of the pad electrode is located at elevations both above and below the pad electrode.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA. Regarding claim 27, AAPA teach substantially the entire claimed structure, as applied to claim 1 above, except explicitly stating that the aperture section of the pad electrode is a hole formed through the pad electrode, such that the aperture section is surrounded by the pad electrode when perpendicularly viewing the semiconductor substrate. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to form the aperture section of the pad electrode as a hole formed through the pad electrode, such that the aperture section is surrounded by the pad electrode when perpendicularly viewing the semiconductor substrate., in AAPA's device in order to simplify the processing steps of making the device by forming the aperture section as a hole through the pad electrode.

Claims 1-2, 4-9, 17-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mashino et al. in view of Uehara (5,262,671), Ko (6,989,108). Mashino et al. teach in figure 10 and related text a semiconductor apparatus, comprising:

- a semiconductor substrate 201;
- a pad electrode 211, having an aperture section formed there-through, and
- a penetration electrode 217 electrically connected to the pad electrode 211, the penetrating electrode being provided so as to pass through each of (b) a hole formed in the semiconductor substrate, and (c) the aperture section of the pad electrode,

Art Unit: 2811

Mashino et al. do not teach a FOX region ("field oxide film"), such that:

the field oxide film having an aperture section;

a pad electrode being formed over the field oxide film so as to overlap the field oxide film when perpendicularly viewing the semiconductor substrate, wherein the field oxide film is located directly under substantially all of the pad electrode as viewed cross sectionally, and

a penetration electrode pass through the aperture section of the field oxide film,

a hole formed in the semiconductor substrate, wherein

the hole in the semiconductor substrate being formed in the aperture section of the field oxide film, when perpendicularly viewing the semiconductor substrate, so that an opening of the hole is smaller than the aperture section of the field oxide film.

Uehara teaches in figures 1 and 2 and related text a FOX region ("field oxide film") 2, wherein

the field oxide film 2 formed over a surface of the semiconductor substrate 1, the field oxide film having an aperture section,

a pad electrode 6, having an aperture section formed there-through, the pad electrode being formed over the field oxide film so as to overlap the field oxide film when perpendicularly viewing the semiconductor substrate, wherein the field oxide film is located directly under substantially all of the pad electrode as viewed cross sectionally, and

wherein the aperture section of the field oxide film is formed in the aperture section of the pad electrode, when perpendicularly viewing the semiconductor substrate.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to form a FOX region ("field oxide film") in Mashino et al.'s device in order to isolate the device from surrounding devices, by conventional method, of which official notice is taken.

Ko is cited to support the position that it is well known in the art and conventional to isolate devices by using FOX regions ("field oxide film").

Note that forming a FOX region, as taught by Uehara, in Mashino et al.'s device, would result in a device a semiconductor apparatus, comprising:

- a semiconductor substrate;

- a field oxide film formed over a surface of the semiconductor substrate, the field oxide film having an aperture section;

- a pad electrode, having an aperture section formed there-through, the pad electrode being formed over the field oxide film so as to overlap the field oxide film when perpendicularly viewing the semiconductor substrate, wherein the field oxide film is located directly under substantially all of the pad electrode as viewed cross sectionally, and

- a penetration electrode electrically connected to the pad electrode, the penetrating electrode being provided so as to pass through each of (a) the aperture



section of the field oxide film, (b) a hole formed in the semiconductor substrate, and (c) the aperture section of the pad electrode,

the hole in the semiconductor substrate being formed in the aperture section of the field oxide film, when perpendicularly viewing the semiconductor substrate, so that an opening of the hole is smaller than the aperture section of the field oxide film,

wherein the penetration electrode is formed in a field area of the surface of the semiconductor substrate,

wherein the aperture section of the field oxide film is formed in the aperture section of the pad electrode, when perpendicularly viewing the semiconductor substrate,

wherein the penetration electrode includes a hole-filling section formed in the hole,

wherein the hole-filling section is made of an electrically conductive material,

wherein a pad electrode formed so that there is no overlap with the hole when perpendicularly viewing the semiconductor substrate,

an insulating film 109 is formed on an internal surface of the hole, between the internal surface of the hole and a sidewall of the penetration electrode,

a penetration electrode includes an electrically conductive film on the insulating film that is formed on the internal surface of the hole,

wherein the hole-filling section is made of an insulating material and of an electrically conductive material,

wherein the insulating film is in direct contact with the field oxide film,

wherein the pad electrode is formed directly on and contacting the field oxide film, wherein

the aperture section in the pad electrode is larger than the aperture section in the field oxide film, when perpendicularly viewing the semiconductor substrate, because the aperture section in the pad electrode can be arbitrarily chosen to be larger than the aperture section in the field oxide film, wherein

a penetration electrode extends through the aperture section of the pad electrode is located at elevations both above and below the pad electrode.

### ***Response to Arguments***

Applicant argues that AAPA does not teach an opening of the hole is smaller than the aperture section of the field oxide film.

AAPA teaches in figure 16 and related text an aperture section of the field oxide film 102 being the width of layers 109 and 115. The opening of the hole is the width of penetrating electrode 115, and does not include insulating layer 109. Therefore, AAPA teaches an opening of the hole is smaller than the aperture section of the field oxide film, as claimed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ori Nadav whose telephone number is 571-272-1660. The examiner can normally be reached between the hours of 7 AM to 4 PM (Eastern Standard Time) Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne Gurley can be reached on 571-272-4670. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

O.N.  
3/28/2008

/ORI NADAV/  
PRIMARY EXAMINER  
TECHNOLOGY CENTER 2800